Characteristics of Biological Weapons

Biological Warfare History

- 14th Century: Plague at Kaffa
- 18th Century: Smallpox blankets
- W W I: Glanders & Anthrax into Horses
- W W II: Japan (Unit 731)
- 1943: USA Program established
- 1953: Defensive program established
- 1969: Offensive program disestablished
- 1979: Sverdlovsk Anthrax incident

BW Agreements

- 1925 Geneva Protocol
- 1969 Nixon renounces BW
- 1972 BW Convention
- 1975 Geneva Conventions Ratified

Overview:

- Current US Status
- Advantages of BW
- BW Agents
- Effects of BW Agents
- Dissemination Methods
- Detection
- General Preventive Measures
- Impact on Medical System

BW Policy

- No use under any circumstance
- Research limited to defensive measures
- We possess NO weaponized biologicals
- Previous weapons stocks destroyed
- Destruction supervised:
  - USDA
  - Dept. of HEW
  - EPA

DoD does Defensive Biological Research because:

- Potential threat
- Noncompliance with the BWC
- Difficulties in verification
- Potential use of BW agents by radical elements
- Possibility of new threats based on biotechnology
- Serves as a deterrent

Destroyed U.S. Biological Warfare Agents

- Lethal
  - B. anthracis
  - Botulinum toxins
  - F. tularensis
- Anticrop
  - Wheat stem rust
  - rye stem rust
  - rice blast
- Incapacitating
  - Brucella suis
  - VEE virus
  - SEB
  - Q fever agent

Soviet BW Priorities "Agents Likely to be Used"

- Smallpox
- Plague
- Anthrax
- Botulism
- VEE
- Tularemia
- Q Fever
- Marburg
- Influenza

Advantages of BW
Are Biologicals the Ultimate Weapon?

- Agents easy to produce
- Inexpensive to produce
- Can disseminate at great distance
- Agent clouds invisible
- Detection quite difficult
- First sign is illness

Advantages of BW Continued

- Overwhelms medical capabilities
- Simple threat causes panic
- Perpetrators escape before effects
- Ideal terrorist weapon

Potential Disadvantages

- Difficult to keep organisms viable
- Difficult to keep operators safe
- "Proper" BW requires sophisticated delivery systems - expensive
- Need low-level application (e.g. "crop dusting") - dangerous
- Epidemics may get out of hand or not materialize

Potential Disadvantages

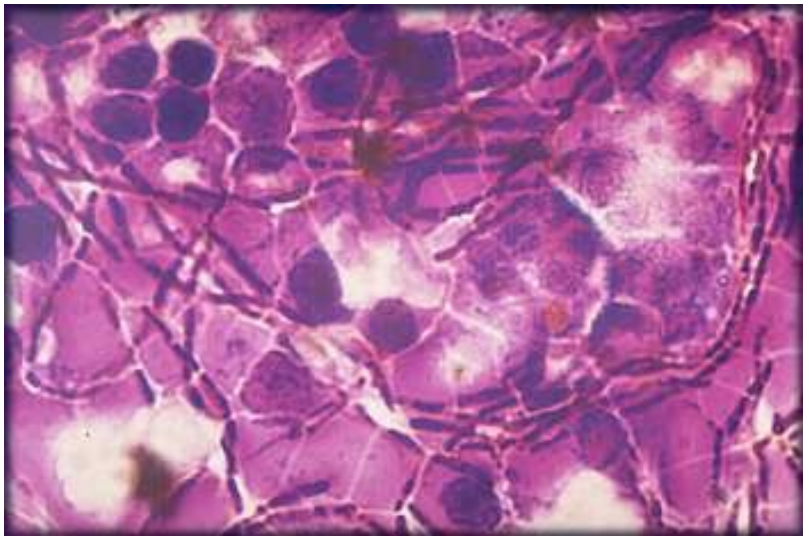
- Epidemics don't happen all at once
- No way to accurately predict the effects
- Poor understanding of consequences
- Return to "bite the hand that launched it"?
- How do you occupy a contaminated area?

The Biological Agents

- Bacteria
- Viruses
- Toxins
- Biotechnology

Bacteria

- Bacillus anthracis (Anthrax)
- Pasteurella tularensis (Tularemia)
- Yersinia pestis (Plague)
- Coxiella burnetti (Q Fever)

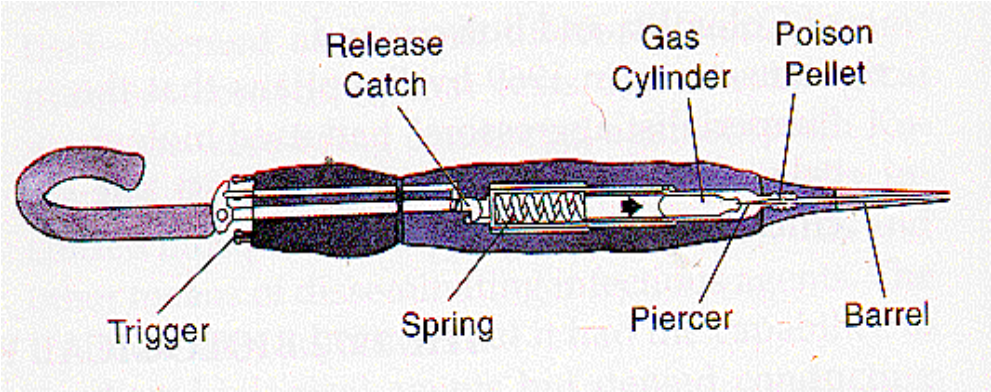


Viruses

- Orthopoxvirus (Smallpox)
- Venezuelan Equine Encephalitis (VEE)
- Rift Valley Fever (RFV)
- Viral Hemorrhagic
  - Ebola
  - Marburg

Toxins

- Botulinum toxins
- Staph Enterotoxin
- Ricin
- Saxitoxin
- Trichothecene mycotoxins



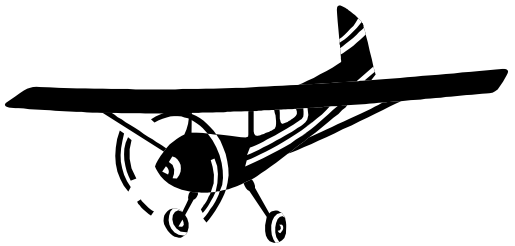
Effects of BW Agents

- Lethal (Anthrax, botulinum toxin, tularemia, ricin)
- Incapacitating (SEB, Q Fever, VEE, RVF)
- Pulmonary Syndromes (plague, Q fever, SEB)
- Communicable (Smallpox, Pneumonic Plague)

Dissemination of BW Agents

- **Aerosol**
  - Point Source
  - Line Source
    - Crop Duster
- Favorable conditions
  - Pre dawn
  - Inversion
  - Flat terrain
  - Wind <20mph

- Portal of Entry
  - Inhalation
    - Most effective delivery route for BW
    - Delivers <10um droplets



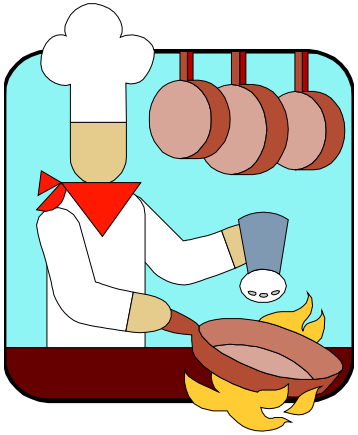
Dissemination of BW Agents

- **Ingestion**
  - Sabotage water supplies

- Water
  - Contaminate water or lake will dilute agent
  - Normal water treatment effective against viruses, bacteria, protozoa
  - Watch near end user
  - Security is a MUST!

Dissemination of BW Agents

- **Ingestion**
  - Sabotage food supplies



- Food
  - Approved sources most important
  - Extreme care in proper food handling procedures
  - End product contamination possibility
  - Security a MUST!

Dissemination of BW Agents

- **Dermal**
  - Mucous membranes or abrasions
- Cover skin during attack
- Good personal hygiene

- **Percutaneous**
  - Vectors
  - Penetration
- Least probable
- Watch out for umbrellas

Detection of BW

- Epidemiologic pattern
- Clinical findings
- Classical microbiology: gram stain, smears, culture
- Antigen detection
- Genetic typing

Detection & Identification

- Difficult to detect

- Medical surveillance is often best source

-Unusual Organisms

-High mortality rate

-Epidemics

Detection & Identification

- Monitor
  - Food
  - Water
- Look for dead or dying
  - Plants
  - Animals

Detection & Identification

- Detection Equipment
  - RAPIDS
  - Portal Shield
    - Korea, SWA
  - Biological Sampling Kit with HHA
  - Biological Identification/Detection System

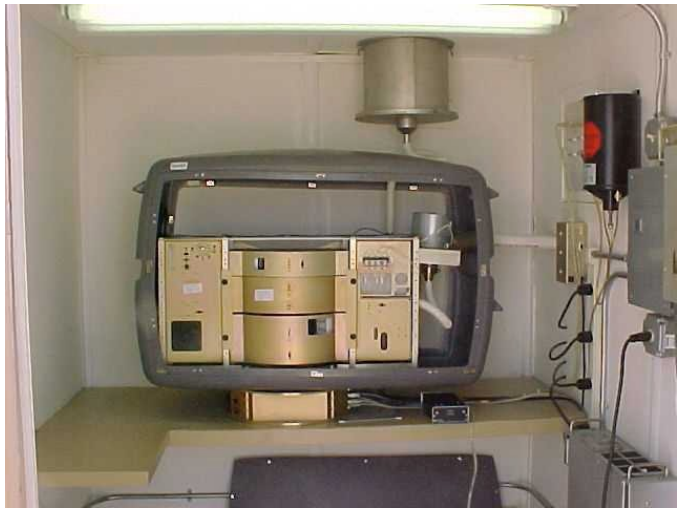
Detection & Identification

- RAPIDS
  - Ruggedized Advanced Pathogen Identification System
    - Clinical and Environmental Samples

Detection & Identification

- Portal Shield

- JPBDS(no tricon)



Detection & Identification

- Biological Sampling Kit
  - Capabilities
    - 8 BW agents(classified)
    - 15 minutes to run test
    - Liquid or powder on smooth surface
    - Storage for 36 months (39°F)
      - 6 weeks at room temp

Detection & Identification

- Biological Sampling Kit
  - Limitations
    - Not for sampling contamination on soil, skin, food, water, air
    - Must have sufficient quantity of BW agent for detection
    - No decon - one time use only

Detection of BW

- Current BIDS Capabilities
  - Anthrax
  - Plague
  - Botulism
  - SEB

Detection of BW

- Second Generation BIDS
  - Tularemia
  - Ricin
  - Brucella abortus
  - Brucella melitensis
- 310th Chemical Company (Ft McClellan AL)
  - Five platoons x 8 units

Laboratory Support

- Theatre Army Laboratory Medical
- (2) Forward Deployed Laboratory - Navy
- USAMRIID
- Theatre Epidemiology Team
- CDC Domestic Laboratory Response Network

General Preventive Measures

- Pre-attack
  - Vaccines
  - Chemoprophylaxis
- During attack
  - Physical Protection
- Post-attack
  - Decontamination

Impact of BW on the Medical Care System

- Terror in affected population
- Overwhelming number, ICU demands, special medication needs
- Need for additional protection in medical personnel
- Problems with handling of remains

Risks to Medical Personnel

- Residual BW agent on clothing or skin:
  - Important near site of dissemination
- Blood/Body Fluids:
  - hazard in lab and clinical setting
- Droplets, fomites:
  - agent dependent
- Cadaver:
  - risks during autopsy, embalming

HCW Precautions with BW

- Mask/gown/glove field-expedient & adequate in most cases
- Upgrade of respiratory protection occasionally warranted
- Agent dependent
- Special impermeable suits not feasible in MASCAL setting

Potential Nosocomial Transmission: BW Agents

- Blood/body fluids
  - Hemorrhagic Fever Viruses
- Drainage/secretion
  - Anthrax
  - Plague
- Respiratory Droplet
  - Plague
  - Smallpox

Effectiveness of Disinfectants

- Standard disinfectants effective vs. all agent classes including spores
- Soap and water work well to wash off most toxins

Decon Recommendations

- APHA
  - Soap and Water
  - 0.5% Cl Solution on Skin
- CDC
  - 0.5% Cl Solution on Skin and Equipment
- TMM
  - 0.5% Cl Solution on Skin
  - 5% Cl Solution on Equipment
- FFGLB CONOPs
  - 0.5% Cl Solution on Skin
  - 5% Cl Solution on Equipment

QUESTIONS???